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THE EFFECT OF THE WAR ON THE CHIEF FACTORS OF POPULATION CHANGE[1]

THERE have recently appeared some figures[2] regarding the "mouvement de la population" in France, Prussia and Bavaria which appear to deserve somewhat more careful analysis than they have received. These figures are derived from official sources and are conveniently collected in the place to which I have made reference.

There are three factors fundamentally concerned in producing changes in the absolute size of the population in a given fixed area (country, province, etc.). These are:

1. The birth-rate,
2. The death-rate,
3. The net immigration rate.

Of these factors the two first are, generally speaking, of the greatest biological interest. This is particularly true of such political units as France, Prussia and Bavaria, where in normal times net immigration makes no significant contribution to the population. Under war conditions permanent immigration to these units was *nil* and may therefore be safely neglected in the following discussion.

The relation of birth-rate and death-rate changes to population changes is a simple one and may be put this way. If in a given time unit the percentage

$$\frac{100 \text{ Deaths}}{\text{Births}}$$

has a value less than 100, it means that the births exceed the deaths, and that the population is increasing within the specified time

[1] Papers from the department of biometry and Vital statistics, School of Hygiene and Public Health, Johns Hopkins University, No. 14. This paper recently formed the basis of an evening's discussion at the writer's seminar.

[2] *Jour. Soc. Stat. Paris,* Soixantième Année, pp. 356–361, December, 1919.

unit. If, on the other hand, the percentage is greater than 100 it means that the deaths are more frequent than the births, and that the population is decreasing, again within the specified time unit. The ratio expressed in (i) may be conveniently designated as the vital index of a population.

were of the births for (*a*) the 77 non-invaded departments of France; (*b*) Prussia; and (*c*) Bavaria; and (*d*) England and Wales, from 1913 to 1918 by years, with the results shown in Table I. The English data were obtained from the quarterly returns (No. 284) of the registrar-general.

TABLE I

Percentage of Deaths to Births

Year	77 Non-invaded Departments of France	Prussia	Bavaria	England and Wales
1913	97 per cent.	——	58 per cent.	57 per cent.
1914	110 " "	66 per cent.	74 " "	59 " "
1915	169 " "	101 " "	98 " "	69 " "
1916	193 " "	117 " "	131 " "	65 " "
1917	179 " "	140 " "	127 " "	75 " "
1918	198 " "	132[3] " "	146 " "	92 " "

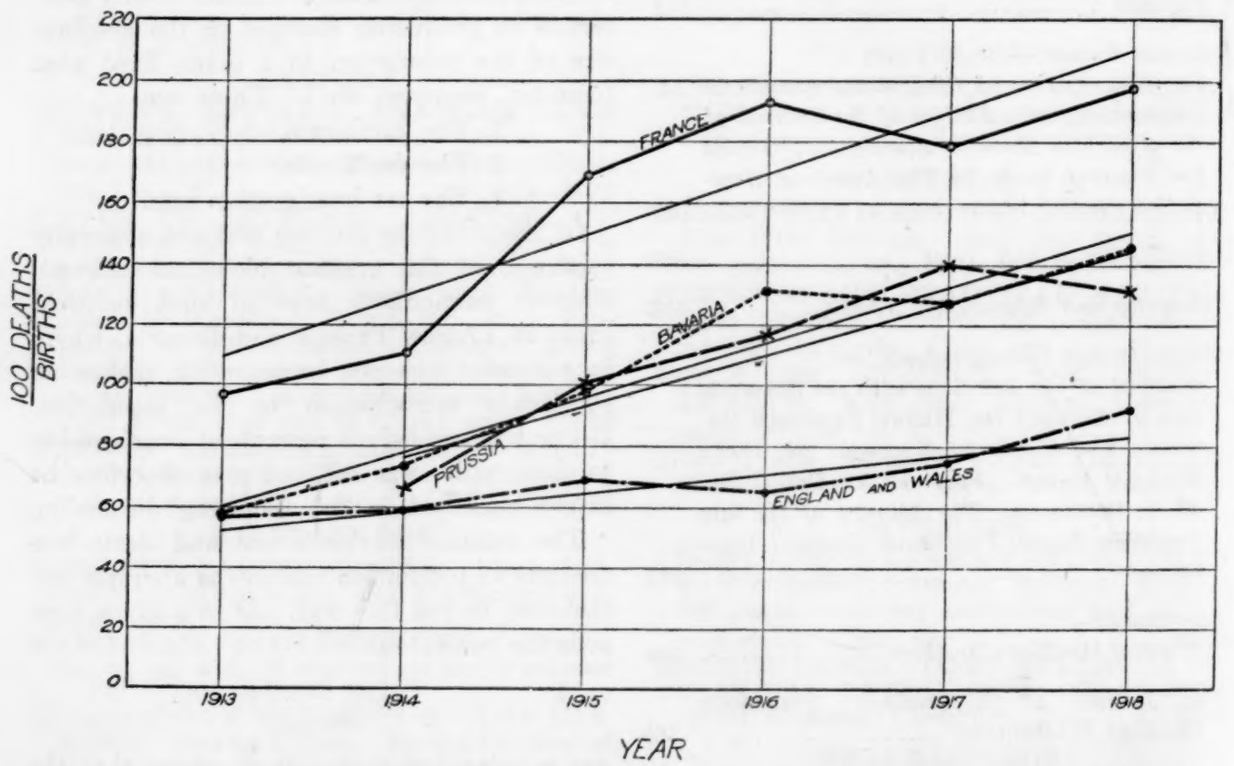

Fig. 1. Showing the change in the percentage, which deaths were of births in each of the years 1913 to 1918 in France (non-invaded departments) (————), Prussia (— —), Bavaria (- - - -) and England and Wales (— - — -).

From the raw data of births and deaths given in the source referred to above I have calculated the percentage which the deaths

[3] This percentage is based upon returns for the first three fourths of the year only.

These percentages are shown graphically in Fig. 1, together with straight lines fitted to each, by the method of least squares. The equations to the straight lines, where y denotes death/birth ratio, and x time, are:

France, $y = 84.0669 + 21.0285\ x$. Origin at 1912. (ii)

Prussia, $y = 59.9 + 17.1\ x$. Origin at 1913, (iii)

Bavaria, $y = 42.4668 + 18.0571\ x$. Origin at 1912. (iv)

England and Wales, $y = 45.9335 + 6.2571\ x$. Origin at 1912. (v)

From this diagram and the data of Table I. we note.

1. In the year prior to the beginning of the war the death-birth ratio of France was at nearly twice as high a level as in any of the other countries dealt with. This fact was of course well known. With a very low birth-rate and a death-rate of the same general order of magnitude as that prevailing in other European countries the French death-birth ratio could not be anything but extremely high.

2. In all the countries here dealt with the death-birth ratio in general rises throughout the war period. This means that the proportion of deaths to births increased as long as the war continued. In France it was slightly more than double in 1918 what it was in 1913. The same was in general true of Prussia and Bavaria. These states started from a very different base in 1913, and the relative rise was even greater.

3. In England and Wales, while the death-birth ratio increased throughout the war period, the rate of this increase was markedly slower than in any of the other countries dealt with.

4. A straight line is not a particularly good fit to the French curve, but it has been used in order to demonstrate more clearly the general trend. In 1915 and 1916 the French percentage rose markedly above the straight line. These were perhaps the years when the forces of war impinged most heavily upon the French.

5. It is noteworthy that despite the epidemic of influenza in 1918, unprecedented in its severity so far as this disease is concerned, none of the curves shows any sharp or marked rise in that year. The curve for England and Wales comes nearest to showing an effect of the epidemic, but even then the rise in 1918 is not so marked as one might have expected.

6. The straight lines for France, Prussia and Bavaria are nearly parallel, or in other words have slopes of about the same order of magnitude (cf., the values of b which determine the slope in the straight line equations). The slope of the line for England and Wales is very different from that of the other three.

These facts raise many interesting points for discussion. The people of Prussia and Bavaria suffered progressive deprivations in respect of food and other comforts of life throughout the war. The sufferings of the French people in these respects were undoubtedly less severe than those of the Germans. All, however, lived for several years on an inadequate diet. This fact alone unquestionably contributed to an ever-increasing death-rate, particularly at the two ends of the life cycle. This same dietary factor undoubtedly also played a considerable part in producing the steady fall in the birth-rate. Here, however, the psychological factor also had a large rôle, and this introduces a point of great interest. Psychologically, the civilian French population and the civilian German population were on a different footing. In the one case, until well into 1918, the attitude was that of the potential conqueror, fighting as an invader in the other's territory. In the other case a war of defense against invasion and further destruction of the home land was being fought. Yet the net effect on the vital indices of the population was, as is shown by the essential parallelism of the straight lines, substantially the same in the one case as in the other. In any other game than war the psychological attitude of offender produces far different results from that of defender. Here the essential and out standing fact is that the net biological outcome of the complex interplay of forces resulting from war was almost identically the same in France and Germany.

Another interesting point is that while France started in 1913 with a death-birth ratio 40 per cent higher than that of the German states—she having at that time an

approximate equality of births and deaths—nevertheless the biological changes induced by the war, as expressed in this ratio, were the same for the one as for the others. We are evidently dealing here with deep-seated and fundamental phenomena of racial biology. The biological reactions of French and Germans in respect of a most fundamental phenomenon, the death-birth ratio, were essentially the same, though they started from such different pre-war bases.

The case of England is obviously entirely different. Starting from about the same base as the German states England's biological reaction to war was much less pronounced. There are many explanations, such as better food conditions, different race psychology from any of the other belligerents, etc., which might be brought forward. There appears at the moment no way of accurately evaluating any of these possible explanations. We must perforce rest with the setting forth of the facts. It is worth noting, however, that though England's vital index changed less in degree than that of the other countries, its movement was the same in kind.

There are two other points which one would like to have information upon. The first is: What will be the course of these death-birth ratio curves in the years following 1918? Will they come back to the pre-war level, and if so, how soon? For England and Wales alone is it now possible to get an indication on this point. For the year 1919 the relation $\frac{100\ \text{Deaths}}{\text{Births}}$ had the value 73 per cent. This represents a marked drop, though it does not bring the curve back to the pre-war level. The appearance of official statistics which will make possible the further plotting of the curves of Fig. 1 will be awaited with great interest. In the second place, one would like to know what the appearance of the curve for the United States would be. Unfortunately, we have for the Registration Area of births data only for the years 1915, 1916, and 1917 now available. So few years appear inadequate to set against the longer series for the other countries.

Raymond Pearl
The Johns Hopkins University

COLORED PHOTOGRAPHS OF PLANT DISEASE SPECIMENS

In the preparation of a handbook of the diseases of vegetables by the U. S. Bureau of Plant Industry for the Food Products Inspection Service of the U. S. Bureau of Markets, it has been found practicable to make colored illustrations by the aid of a firm of commercial photographers.[1]

The specimens of diseased vegetables were collected by the writers to a large extent in the Chicago markets and freight yards. In addition numerous field excursions were made into the region surrounding Chicago for the purpose of securing specimens. To date, over two hundred illustrations have been completed, a number of which were exhibited at the Baltimore and St. Louis meetings and aroused a very general and real interest on the part of the botanists. So many questions were asked concerning the process by which the illustrations were prepared that the writers are using this means of making the answers as generally known as possible.

A vertical camera was used and the specimens were arranged on a ground-glass background which eliminates shadows. Occasionally a black velvet background was used, and leaves usually were laid on wet blotting paper to prevent curling. In making the exposures, artificial light was seldom used. Most of the subjects have been reproduced in natural size on 8 by 10 inch negatives. The camera was equipped with Cooke Process Lenses, Series 5, of 16 or 18 inches focal length, or with a Goerz Dogmar lens of 12 inches focal length. Color filters, usually the K2 yellow or the green, and occasionally the red, were used in about 75 per cent. of the exposures. About two-thirds of the exposures were made on Seed's Panchromatic plates and the remainder on Polychrome or Standard Orthonon plates. The legends are etched in the gelatin of the negative. The majority of the subjects have been photographed in duplicate to insure against loss of the record by breakage.

Prints are made either on Defender or Kresko printing-out paper or on Defender or

[1] Webster Bros., Chicago, Illinois.

Azo developing paper, preferably the latter in each case. The coloring is secured by painting directly upon the dry prints with transparent dyes. The detail of the image is supplied by the lines of the print itself. Water-soluble aniline dyes in the colors yellow, orange, red, brown, blue and royal blue are commonly used. The original plate is colored with the specimens before the artist and, while it has been necessary to supervise closely the color work on this print, a surprising degree of skill and accuracy has been developed by some of the operatives. Since most truck crop disease specimens are highly perishable and change considerably during the time elapsing between exposure of the negative and the completion of prints, even though held in a refrigerator, it has been found advantageous to register the exact colors on some other print of proper color value at the time of exposure, or if possible to collect fresh specimens of a similar character.

Inasmuch as the print is to serve as a background for the color, the kind of paper chosen and the intensity of the image depend upon the color effects desired. For example, the printing-out paper is desirable for most yellows, browns, and reds, while for purples, blacks, and dark greens the developing paper is preferable. However, the printing-out paper serves very well for the majority of greens and has been more extensively used.

After the dyes are mixed and diluted to secure the desired shade, the gelatin surface of the print is prepared for coloring (probably softened and swelled) by wiping with a cloth moistened with alcohol, ammonium hydroxide, or more commonly saliva, and the dye is applied with a brush in rather liberal amounts of which the excess is removed by means of a blotter. The quality of the color is determined by the proportions of the dye mixture and the type of paper used for the print; the intensity of color is determined by the dilution of the dye, the intensity of the photographic image, and the length of time the excess dye is allowed to remain on the print before blotting. In case of error the color can be removed with ammonium hydroxide. In some instances a very small amount of this substance added to the dye causes the latter to spread and adhere more satisfactorily. Details in white or background color, such as holes in a leaf, can be conserved by coating with a paste or enamel which is insoluble in ordinary solvents and is removed with benzine after the coloring is completed. Details in black, such as the blackened veins in cabbage black rot, can best be shown by the image on Azo paper. After the coloring is completed, the prints are run through a mordant bath to fix the colors. Combinations of acetic acid, formalin, and other mordant reagents constitute this bath, the exact composition of which depends in part upon the colors to be fixed. The gelatin surface must be thoroughly wetted by the solution. The prints are then rinsed in a water bath, placed face downward on squeegee boards, sponged, and passed through rollers to remove the excess water. The prints are mounted while wet on muslin or Japanese paper with a cardboard flap and allowed to dry on the squeegee board.

While these colored photographs are ultimately to be used for lithographs, it has been found feasible to reproduce about ninety sets of fifty duplicates each for immediate use by hand coloring of duplicate prints, the original colored print being used as a guide. However, this process is too laborious and unreliable for large scale production and the colors will not endure indefinite exposure to light. Colored lantern slides of a very gratifying quality have also been made.

This process of color reproduction could well be utilized in other branches of science and there appears to be no reason why it could not be perfected and employed by educational and research institutions. The results of this method of scientific illustration are far superior to uncolored reproductions and are, it is believed, an improvement over other types of color reproduction because of the accuracy of detail afforded by the photographic image. Such illustrations should find wide use in

technical publications and especially in charts, stereopticon slides, and extension bulletins.

Max W. Gardner,
Geo. K. K. Link

WILLIAM DIXON WEAVER

Dr. William D. Weaver, for a number of years editor of the *Electrical World*, a man of the true scientific spirit, a friend of education and scholarship, a devotee of literature, an upholder of the finer things of life, and one of the most delightful of companions, died at his home in Charlottesville, Va., on November 2, 1919.

Dr. Weaver was born on August 30, 1857, at Greensburg, Pa. After a year spent in preliminary study at the University of Kentucky, he entered the United States Naval Academy, from which he graduated as cadet engineer in 1880. Only a few months ago Dr. Weaver received the honorary degree of LL.D. from the University of Kentucky. After graduation the young officer served in the Navy for twelve years except for one year's leave of absence in 1884, during which he studied electricity and conducted some investigations in the electrical laboratory of the Sorbonne, Paris, and the School of Electrical Engineering, London. In 1883 he was a member of the U. S. S. *Yantic* expedition sent to the relief of Lieutenant Greely, the Arctic explorer. When he resigned from the Navy in 1892 he held the relative rank of ensign.

Mr. Weaver's life work was that of an editorial exponent of the science, art and industry of electricity. After resigning from the Navy he spent a year in the business of manufacturing electrical appliances, and he became editor of the *Electrical World* in 1893. In 1896 the *American Electrician* was established, and this magazine, a monthly, with Mr. Weaver as editor, became notably successful. Mr. Weaver accomplished the difficult task of making a magazine that was useful and interesting to the "practical" man and at the same time of high technical standing. His gifts as a technical journalist were indeed of a high order. In 1906 the *American Electrician* was absorbed by the *Electrical World*, and Mr. Weaver retaining his connection with that paper until May, 1912, when he retired, removing to Charlottesville, Va.

Of a modest, retiring nature, Mr. Weaver did a great deal for electrical advancement, although often he remained in the background, cooperating with others whose names appeared in connection with the particular task in hand. He became an associate of the American Institute of Electrical Engineers in 1887 and became successively a member and a fellow of the society. For six years Mr. Weaver served as manager of the institute, and it is probable that he could have been elected president had he not refused to entertain the honor. On May 16, 1919, as the result of the work of a group of friends and admirers, a bronze tablet was unveiled at the headquarters of the American Institute of Electrical Engineers in recognition of Mr. Weaver's services. It bears a bas-relief portrait and this inscription:

> This tablet is dedicated to William Dixon Weaver, engineer, journalist, scholar, to record his influence in the development and promotion of the art and science of electrical engineering.

In 1900 Mr. Weaver was appointed by the United States government as an official delegate to the International Electrical Congress at Paris, but, upon his suggestion, the appointment was transferred to Dr. A. E. Kennelly, of Harvard University. He had much to do with the St. Louis (1904) International Electrical Congress, of which he was treasurer and business manager. With Dr. Kennelly, who was general secretary, he supervised the publication of the *Transactions* of that congress in three large volumes, published in 1905.

An excellent judge of engineering literature, Mr. Weaver was for several years chairman of the Library Committee of the American Institute of Electrical Engineers. In 1901 Dr. S. S. Wheeler purchased the Latimer Clark collection of electrical books and pamphlets and presented it to the institute. Thereafter, as a labor of love, Mr. Weaver edited the Catalogue of the Wheeler Gift of Books,

Pamphlets and Periodicals in the Library of the American Institute of Electrical Engineers. This catalogue raisonné, in which the late Brother Potamian collaborated with Mr. Weaver was published in two handsome volumes in 1909 and stands as a monument to Mr. Weaver's learning and taste.

It is believed that Mr. Weaver was the first to lay before the late Andrew Carnegie a plan for a home for the engineering societies in New York City which later resulted in the Engineering Societies' Building and the Engineers' Club.

A French scholar and an admirer of French achievements in science and much in French literature, Mr. Weaver was a collector for many years of books, pamphlets and pictures relating to the French Revolution. It is said that few private collections in the United States of books relating to the French Revolution were more complete than his. At one time he wrote about Paris:

> I feel more at home in that city than in any other in the world, on account probably of my first impressions of the real world having been received there.

But Lieutenant Weaver was nevertheless a thorough American. During the Spanish-American war of 1898 he served as volunteer chief engineer on the U. S. S. *Glacier*. In 1915, after his retirement, he was asked to become a member of the Naval Advisory Board, but declined on account of his health.

After taking up his home in Charlottesville Mr. Weaver became at once at home in the scholastic atmosphere of the University of Virginia. It is reported that he was offered a place on the faculty of this university a few years ago. Some time before his death Mr. Weaver gave nearly his entire collection of technical books to the University of Virginia.

An independent thinker, Mr. Weaver was tenacious in adhering to his opinions, although quiet and pleasant in manner and not vociferous in advancing his views. He felt strongly that cultural studies should not be neglected in technical education, and deplored a purely materialistic attitude in schools of engineering.

Mr. Weaver was one of the founders of the Illuminating Engineering Society and also of the American Electrochemical Society. He served for three years as manager of each. He had also much to do with the formation of the Commission on Resuscitation from Electric Shock. He was a member of the Société Internationale des Electriciens and had been honored by the French government as an officer de l'Instruction Publique.

With an acute distaste for public appearances, Mr. Weaver found his greatest pleasure in his home and library. His home life was ideal. In 1900 he married Miss Mildred Niebuhr and the union was blessed with six children. He had been a sufferer from heart trouble and passed away in his sleep.

WILLIAM E. KEILY

STATE GRANTS FOR SCIENTIFIC INVESTIGATIONS IN ENGLAND

A JOINT deputation from the British Medical Association and the British Science Guild waited upon the Right Hon. A. J. Balfour, Lord President of the Council, at the offices of the Privy Council on March 2, to place before him certain considerations with regard to state awards for scientific research.

According to the report in *The British Medical Journal* Sir Watson Cheyne said that the object of the deputation was to bring forward the question of state awards for scientific work after such work had been done. Scientific workers were assisted by scholarships and so forth while doing their work, but after it was done there was at present no provision for them, although, excited by the interest of their investigation, they had often neglected to make any provision for themselves. Moreover, it was the tradition that a scientific man should immediately publish his discoveries, making no attempt to conceal any knowledge in order to secure personal advantage.

Sir Clifford Allbutt, president of the British Medical Association, referred in particular to the conditions under which medical men worked. Those conditions were governed by the very high-standard of ethics

maintained in the profession. No medical man could have honor in the profession if he descended to any kind of direct or indirect advertisement. No medical man was permitted to take out a patent. The large hospitals no doubt gave a field to the clinical worker which might offer considerable indirect reward, but that did not apply to the research worker, who was rather hidden behind his work. He knew men of very high academic attainments working enthusiastically at research who were declining lucrative appointments in order that they might finish —which they never did, of course—their experimental investigations. It was from such disinterested research—not utilitarian nor aimed at sensational or immediate results—that the greatest benefits accrued to mankind. He himself was chairman for some years of the Scientific Relief Committee of the Royal Society. Mr. Balfour would perhaps be surprised if he were to tell him privately the names of the very distinguished scientists who, or whose representatives, came forward to ask for grants in order to tide over a time of great difficulty. It was desirable to attract a great many more potential workers. The field of comparative pathology, for example, lay untilled; at present it offered no reward, direct or indirect. It would be said that the Treasury must be careful about expenditure, but he feared that the expenditure under this head would not be very great. He was afraid that the highest kind of intellectual research was rather scarce, and consequently the demands for grants would not be so heavy as might be anticipated.

Sir Richard Gregory said that in medicine the great experimental work was rarely done by the successful practitioner or consultant. It was carried out in the research laboratories by men who occupied posts carrying only moderate salaries. There was the further consideration that the highest type of worker —the genius—in medicine or any other department of science was precisely the man who was not amenable to control—the free worker who followed up a clue in some department of knowledge to the willing sacrifice of himself. There should be a fund of some kind for making suitable awards, to be considered as payment for results achieved, and not as grants for favors to come. The scientific worker (he added), unlike the worker in literature or art, could not dispose of his achievement to the public for profit.

Mr. Balfour said that he had always been an advocate—even a vehement advocate—of two things which, until quite recent years, the British public had been very slow to realize: the one, that the material progress of mankind depended upon the applications of science, and the other, that there must be pure science before these could be applied. While that was still worth saying even now on the public platform, it was a commonplace to everybody sitting around that table. They were all agreed that the state—which, after all, represented the people of the country and could not be in advance of them by more than a certain amount at any given time—had been backward in the past in its support of science. The only difference among them, if there was any difference, was as to the way in which the stimulus could best be given to those brains in the country best qualified to further scientific research and the subsequent industrial research based upon it. The view of the deputation, as he understood, was that when a man whose opportunities and genius permitted him to work at research had turned out some brilliant discovery the state should give him a reward.

Everybody must feel that the straits to which many distinguished men of science were reduced after devoting their whole lives to research without any desire for pecuniary reward were rather pathetic, and in many cases discreditable. For his own part he thought it most desirable that some remedy should be found. But he wondered how many such people would get the reward under the scheme which in rough outline had been laid before him that day. He thought the truth was that in the case of the very great discoveries, while it was often possible to go back to the individual who started the train which led to the great result, he himself

had not directly produced that result. Faraday did not discover the telephone or wireless telegraphy or a practical method of electric lighting; what Faraday did was to make all those things possible, to lay the scientific basis of them. It was not easy to see how the reward was always or even commonly to be got into the right pocket. The amazing progress which medical science had recently made in stamping out certain forms of zymotic disease was, indeed, a wonderful triumph; but it was very hard to pick out the individuals to whom that triumph was due. If he might put himself in the unfortunate position of a Prime Minister, the difficulty of saying that A. should have the money which was available, or that B. should have it, would be very great, even though he took the best advice obtainable. There would be certain dramatic cases in which the whole public would be behind the Prime Minister in apportioning a particular reward, and yet when the historian came to look back upon the long labors which had made the triumph possible, might not he have to say that the genius to whose intuition and inspiration the achievement was really due had died unrewarded? Did anybody think that Maxwell, for instance, would ever have come in for any share of this parliamentary grant, seeing that his discoveries were such as very few were capable of comprehending in the form in which he gave them to the world? Yet his discoveries lay at the root of much of the subsequent progress in physical science. Sir Clifford Allbutt had pointed out that this was not asking very much from the taxpayer, because the number of people who would actually get the reward was so small. But, looked at from the point of view of the encouragement of research, that meant that a young man, going into research, and surveying the possibilities of reward, would find he had the chance only of one in ten thousand. He might contribute himself as a colloborator to the great discovery for which somebody else, quite properly, got the chief credit. The collaborator, on this plan, got nothing, yet without the collaboration of people not in the first rank could progress be made? Germany had never excelled this country—he would like to use a stronger phrase, but he would be nationally modest—in the production of those geniuses who started original discovery; but it had surpassed this country in the organization of men not of the front rank whom it had brought together in cooperation towards a common end. He did not see how the investigations of a body of cooperative workers could be stimulated by rewarding a few isolated individuals. At any rate, he saw difficulties. Was there not more to be said for some attempt to stimulate research by improving the position of the researchers while they were doing their work? He was told the other day that there were people carrying on research work at Cambridge for a smaller remuneration that the town council of Cambridge paid to its unskilled employees. This showed that there was still a great deal to be done in the way of aiding research while it was proceeding. He agreed entirely with Sir Richard Gregory that while the state might aid research it would only destroy research if it were resolved to control it. The best men would not be controlled. The state was incapable of forming a judgment on the merits of an abstruse physical of physiological inquiry. That must be left to the genius of the men themselves. But he hoped it did not follow that it was quite impossible to combine with that independence of the worker some better reward for the work he was doing. He was afraid, however, that if the Treasury were represented at that assembly, it would say it preferred the original scheme laid before him by Sir Watson Cheyne. The framing of any such ideal scheme would require a great deal of thought.

In conclusion, Mr. Balfour said that while he had spoken for himself alone, he was also there in some sense as representing the Prime Minister, and he would like to add that there was no man living who had shown a greater sympathy with scientific development than Mr. Lloyd George, who had been responsible for some of the greatest advances which had been made in the direction of state aid for

scientific and medical research. When he reported to him what had passed that day, they might be sure the Prime Minister would give it the most sympathetic consideration. He was far from laying it down that the state should not on occasion imitate our forefathers in the case of Jenner and offer a pecuniary reward to some great man of science whose services had been exceptional and whose achievements were obviously his own. But he would not wish that to be a part of the regular system of dealing with discovery in this country. He hoped that what the government had already done would be found to be far greater in its ultimate results than perhaps the public at large, or even men of science, as yet had realized. He feared that they had not been supported as they might have been by men of great wealth in this country. There had been admirable exceptions, but either we had fewer millionaires than the Americans or we were less lucky in them, for there was no doubt that private individuals across the Atlantic had contributed on a scale which did justice to their generosity and was likly to produce great results for the whole world. Probably it was out of the question to hope completely to emulate them, but he did not despair that among the wealthy men in this country some might be found, in addition to those who had already shown themselves generous benefactors, who would do much to aid and stimulate that research into the laws of nature and that application of those laws upon which our main hopes for the amelioration of the lot of the human race must depend.

SCIENTIFIC EVENTS

THE MANUFACTURE OF SYNTHETIC AMMONIA IN ENGLAND[1]

The Ministry of Munitions announces that Lord Inverforth has arranged for the sale of H. M. Nitrate Factory of Billingham-on-Tees to Messrs. Brunner, Mond, and Co., Ltd. The purchasers will form a company to take over the factory, and will be responsible for all outstanding liabilities of the ministry in connection with the project. This factory, the erection of which was commenced early in 1918 by the Department of Explosives Supply, was designed for the manufacture of synthetic ammonia and for the production of 60,000 to 70,000 tons of ammonium nitrate annually.

During 1916 the Nitrogen Products Committee had established a laboratory in premises placed at its disposal in the new Ramsay building of University College, London, and the Committee's research staff, under the direction of Dr. J. A. Harker, was engaged in an experimental investigation of a number of problems relating to nitrogen fixation. Although it was not anticipated that there would be any shortage of supplies of ammonia, yet it was deemed desirable, in view of the special ability of the synthetic ammonia process for the needs of this country, that an experimental study of it should be made forthwith, so that the required information should be available if necessary.

After a year's experimental work, the progress made was considered so encouraging that the Committee decided to establish a moderate-sized technical trial unit, and funds for the purpose were allocated by the treasury. It was hoped, by means of this plant, that a study of the chemical engineering problems could follow upon that already made of the pure chemistry of the reactions involved, but the committee did not suggest the establishment of the process as a war measure upon an industrial scale. In 1917, however, the Explosives Supply Department considered that the position reached in the experiments justified it in recommending the erection of a large works, in substitution for the committee's cyanamide project, and a site at Billingham, some 260 acres in extent, was ultimately chosen for this purpose. But a number of difficulties supervened, and construction was slow, and at the time of the armistice only a few permanent buildings and a number of temporary structures had been erected, though a large amount of plant had been ordered.

The purchasers of the factory now undertake

[1] From *Nature*.

to complete the scheme by providing the additional buildings and plant required for the synthesis of ammonia and its oxidation to nitric acid and nitrates suitable for the manufacture of explosives and fertilizers. It is understood that the company has acquired a large amount of additional land and that it intends to develop the project on a very large scale. The factory has been re-designed on a peace as distinct from its former war basis, and in many particulars the new plant will represent a substantial advance, both in the ammonia and nitric acid sections, on anything previously used in Germany.

SPANISH EDITION OF THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION

AT the meeting in New Orleans the board of trustee's presented the following report:

The first year of the Spanish edition of *The Journal* has been reasonably satisfactory. Its publication was undertaken with some hesitancy because it meant a venture in an entirely new field. Other periodicals had been published in this country in the Spanish language for circulation in South and Central America, but their publication was undertaken for commercial reasons. Our Spanish edition entered the field solely as a scientific periodical for educative and scientific purposes, and it has been received with approbation. The field was a difficult one to work in the first place because there was not available any physician's directory, or any even fairly reliable list of physicians of standing. However, a list of such physicians has been gradually assembled so that now there is a fairly reliable one at the association headquarters. Included in this list are the physicians of Central and South America and the Philippine Islands.

Another difficulty has been the mailing facilities; these have been anything but satisfactory. Under normal conditions it takes a long time for a communication to reach the South American countries, with the exception of those bordering on the Gulf of Mexico.

At the end of the year the subscription list comprised 2,908 names. To those who appreciate the difficulties and know the conditions that prevailed at the beginning, this must be regarded as quite satisfactory. Roughly, this circulation is as follows: The largest number of subscribers naturally are in Mexico—539; in Cuba next, 530; Argentina, 270; Brazil, 194 (in Brazil Portuguese is the language in general use, therefore it is rather remarkable that this number has been secured there); Chile, 179; Spain, 142; Peru, 101. The rest of the circulation is in Bolivia, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Nicaragua, Paraguay, Salvador, Santo Domingo, Uruguay, Venezuela, Panama and Porto Rico.

It is not to be expected that this journal could be published without a loss for the first few years. As will be remembered, the venture was undertaken at the request of the International Health Board of the Rockefeller Foundation, which agreed to pay half the loss. It should be explained in this connection that the number of copies of each issue printed was 4,500 to 5,500, and that the excess above those subscribed for was sent out as sample copies. Hereafter, of course, there will be fewer sample copies distributed; consequently a less expense with an increased income. During the months of January, February and March the circulation has been steadily increasing. The actual loss to the association to date has been less than $10,000, which amount promises to be returned with more than gratifying results within the first five-year period of its publication.

GRANTS FOR RESEARCH MADE BY THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE Committee on Grants of the association held a meeting in April, and distributed grants amounting to forty-five hundred dollars as given below. The next meeting of the committee will be in connection with the annual meeting of the assocation in December, when grants for the year 1920 will be made. Applications or suggestions in regard to grants may be made to any member of the committee, and should be received before December 1. The present membership is: Henry Crew, chairman; W. B. Cannon, R. T. Chamberlin, G. N. Lewis, George T. Moore, G. H. Parker, Robert M. Yerkes, and Joel Stebbins, secretary.

Following are the grants for 1919:

MATHEMATICS

Three hundred dollars to Professor Solomon Lefschetz, of Kansas University, to assist in the publication of his memoir on algebraic surfaces, which was awarded the Bordin prize of the Paris Academy of Sciences.

One hundred dollars to Dr. Olive C. Hazlett, of Mount Holyoke College, in support of her work on the theory of hypercomplex numbers and invariants.

PHYSICS

Two hundred dollars to Professor A. A. Knowlton, of Reed College, in aid of a determination of the relation between chemical composition and magnetic properties in Heusler alloys. The particular problem is to find the precise proportions in which the elements must be mixed in order to get the maximum value of magnetic intensity at saturation.

One hundred dollars to Professor John C. Shedd, of Occidental College, in aid of a further study of snow crystals, similar to that which he has already published.

ASTRONOMY

Six hundred dollars to Professor Philip Fox, of Dearborn Observatory, Northwestern University, in support of his work on the photographic determination of stellar parallaxes. This is a renewal of the grant made for the same purpose in 1917, but the use of which was interrupted by the war.

One hundred dollars to Professor Anne S. Young, of Mount Holyoke College, for the determination of the positions and proper motions of stars from photographic plates already taken. The work is being done in cooperation with the Yerkes and McCormick Observatories.

GEOLOGY

Two hundred and fifty dollars to M. Ferdinand Canu, of Versailles, France, to carry forward toward completion the very significant studies upon the classification of bryozoa in which he is collaborating with Dr. R. S. Bassler at the U. S. National Museum.

Two hundred and fifty dollars to Mr. Frank B. Taylor, of Fort Wayne, Indiana, for a field study of the moraines of recession in the St. Lawrence Valley.

ZOOLOGY

Two hundred and fifty dollars to Professor S. I. Kornhauser, of Denison University, for a continuation of his work on the sexual characteristics of the membracid insect *Thelia bimaculata*. The first part of this work was published in September, 1919, in the *Journal of Morphology*.

Two hundred dollars to Dr. P. W. Whiting, of St. Stephen's College, for breeding outfit and temperature apparatus to be used for genetic and cytological researches on *Ephestia* and *Hadrobracon*.

BOTANY

Five hundred dollars to the editorial board of *Botanical Abstracts* for editorial and office expenses in connection with the preparation of manuscripts. The general interests of botany, in both its national and international aspects, would seem to be best served at this time by aiding this abstract journal for another year.

Five hundred dollars to Dr. I. W. Bailey, of the Bussey Institution, Harvard University, for aid in investigations upon: (1) Myrmecophytism; particularly certain supposed symbiotic relations between ants and higher plants. (2) Relations between ants and fungi, particularly ants as disseminators of disease. (3) Cytology of the cambium. The entomological work involved will be done in collaboration with Professor W. M. Wheeler, and the headquarters for the summer will be at the British Guiana Tropical Research Station of the New York Zoological Society.

ANTHROPOLOGY, PSYCHOLOGY AND EDUCATION

One hundred dollars to Mr. S. D. Robbins, of the Harvard Psychological Laboratory, for measurements of blood pressure of a trephined stammerer.

Two hundred dollars to Professor Daniel W. LaRue, Stroudsburg State Normal School, Pennsylvania, in support of experimental work on a phonetic alphabet.

Two hundred dollars to Professor Margaret F. Washburn, Vassar College, for a study of emotional characteristics of certain racial groups in New York City.

Two hundred dollars to Professor Joseph Peterson, George Peabody College for Teachers, Tennessee, in support of a study of the qualitative differences in the mentality of whites and negroes.

Two hundred dollars to Professor A. A. Schaeffer, University of Tennessee, in support of an experimental study of orientation and the direction of movement of animals, and particularly of the "spiral path" in man.

PHYSIOLOGY AND MEDICINE

One hundred dollars to Professor Theodore Hough, University of Virginia, in support of his studies with Dr. J. A. Waddell on blood changes after severe hemorrhages.

One hundred and fifty dollars to Professor Carl J. Wiggers, Western Reserve University, in support of his investigations of the cardiac function by optical registration.

Joel Stebbins,
Secretary

SCIENTIFIC NOTES AND NEWS

FELLOWS elected at the annual meeting of the American Academy of Arts and Sciences include Cecil Kent Drinker, Harlow Shapley, William Underwood and Clark Wissler. Maurice Caullery and Jacques Solomon Hadamard were elected foreign honorary members.

AT the annual meeting of the Association of American Physicians held in Atlantic City, N. J., May 4 and 5, Dr. William S, Thayer, Baltimore, was elected president; Dr. Herbert C. Moffitt, San Francisco, vice president; Dr. Thomas McCrae, Philadelphia, secretary; Dr. Thomas R. Boggs, Baltimore, recorder, and Dr. Joseph A. Capps, Chicago, treasurer.

DR. REID HUNT, of Harvard University, was elected president of the United States Pharmacopeial convention, on May 12, to succeed Dr. Harvey W. Wiley.

COLONEL MARSTON TAYLOR BOGERT, professor of chemistry in Columbia University, has been elected president of the American Section of the Société de Chemie Industrielle of France.

DR. STANLEY H. OSBORNE, formerly epidemiologist of the Massachusetts State Department of Health, has been appointed director of the Division of Preventable Diseases in the Connecticut State Department of Health.

WE learn from Nature that at the annual general meeting of the Marine Biological Association, held in London on April 28, Sir E. Ray Lankester was reelected president and Sir Arthur Shipley chairman of the council. The Right Hon. Sir Arthur Griffith Boscawen was added to the list of vice-presidents, and Messrs. T. H. Riches and Julian S. Huxley became members of the council.

SIR HENRY A. MIERS, vice-chancellor of the Victoria University of Manchester, formerly professor of mineralogy at Oxford, has been reelected president of the Manchester Literary and Philosophical Society for the session 1920–21.

MR. WILFRED H. PARKER has been appointed director of the British National Institute of Agricultural Botany. The institute, including the Official Seed-testing Station for England and Wales will be housed in quarters in course of erection at Cambridge.

DR. E. S. MOORE, professor of geology and mineralogy and dean of the School of Mines of the Pennsylvania State College, has been appointed a member of the committee on sedimentation of the National Research Council. He will represent the colleges and universities in the eastern states in an organization for the stimulation of research work on sedimentation.

PROFESSOR W. W. ROWLEE, of Cornell University, has been engaged to make a further investigation of balsa wood in Central America. Sailing to Costa Rica immediately after Commencement, he will resume the work which he began on his first trip in 1918–19. He will be accompanied by Instructor Harvey E. Stork.

PROFESSOR L. C. GLENN has recently been on leave of absence from Vanderbilt University investigating for the U. S. Department of Justice the physiographic and geologic problems involved in the disputed jurisdiction between Texas and Oklahoma in the Red River valley part of the Burkburnett oil field. He plans to spend a part of the coming summer there in further studies of the river's changes in that region.

W. L. WHITEHEAD, recently of the geological department of the Massachusetts Institute of Technology, has gone to South America to carry on geologic exploration in Bolivia, Argentina and Chile.

IT is noted in *Nature* that the Royal Academy's exhibition this year includes a presentation portrait of Sir Clifford Allbutt painted by Sir William Orpen. The picture hangs in the first gallery and bears the inscription: "Sir Clifford Allbutt, K.C.B., M.D., F.R.S., Regius Professor of Physics in the University of Cambridge; President of the British Medical Association. Presented to him by his Profession, 1920." A proof of the mezzotint engraving of the portrait is exhibited in the room devoted to engravings, drawings and etchings.

The John Calvin McNair lectures at the University of North Carolina were delivered this year by Professor Edwin G. Conklin, of Princeton, who spoke on the subject of "Human Evolution in Retrospect and Prospect."

The University of North Carolina chapter of Sigma Xi was installed May 26 by Professor C. E. McClung, of the University of Pennsylvania, president of Sigma Xi. The charter members of the North Carolina chapter are Drs. James M. Bell and Joseph Hyde Pratt, initiated at Cornell and Yale respectively, and Drs. F. P. Venable, H. V. Wilson, W. D. MacNider, A. S. Wheeler, W. C. Coker and William Cain, all members of the faculty.

The meeting of the University of Pennsylvania Chapter of the Society of the Sigma Xi on May 26 was held at the Flower Observatory, Highland Park. Addresses were made by Professor Eric Doolittle on "Star Clusters and Star Nebulæ" and by Professor Horace C. Richards on the "Einstein Theory of Relativity." Preceding the addresses, supper was served on the lawn to one hundred and fifty members and guests. Officers elected for 1920–21, are M. J. Babb, president; O. L. Shinn, vice president; H. C. Barker, secretary; H. S. Colton, treasurer.

Professor George B. Mangold recently spoke before the Anthropological Society of St. Louis on "Ethnic Types in America." On May 5, Dr. W. W. Graves gave a lecture on the "Scaphoid Scapula."

The Croonian lecture of the Royal Society will be delivered by Professor William Bateson on June 17 upon the subject of "Genetic Segregation."

Sir Arthur Newsholme, who has returned to England, has in press a volume of American addresses on Public Health and Insurance, which will be published by the Johns Hopkins University Press.

According to the English correspondent of the *Journal* of the American Medical Association, Sir William Osler left an estate of the gross value of $80,000 with a net personality of $53,000. He left his medical and scientific library (as cataloged) to the McGill University, Montreal, and all other property to his wife. At her death or earlier, if she should wish it, his residence, 13 Norham Gardens, Oxford, is to be given to the dean, canons and governing body of Christ Church as the residence of the regius professor of medicine.

We learn from *Nature* that a committee of fellows of the Royal Society and members of the University of Cambridge has been formed for the purpose of collecting funds for a memorial to be erected in Westminster Abbey to the late Lord Rayleigh in recognition of his eminent services to scence. Lord Rayleigh was both president of the Royal Society and Chancellor of the University, and an appeal has been issued by the society and the university. It is thought, however, that there may be some men of science unconnected with either of these bodies who may wish to show their appreciation of Lord Rayleigh's work. Donations may be sent to the hon. treasurers of the fund, Sir Richard Glazebrook and Sir Arthur Schuster, at 63 Grange Road, Cambridge.

Marvin Hendrix Stacy, professor of civil engineering and dean at the University of North Carolina, has died at the age of thirty-seven years.

Frederick Kolpin Ravn, professor of plant pathology in the Royal Agricultural College of Denmark, Copenhagen, died from blood poisoning on May 24, in East Orange, N. J., aged forty-seven years.

Dr. Alexander Ferguson, professor of pathology in the School of Medicine, Cairo, has died at the age of forty-nine years.

Captain Ettrick William Creak, F.R.S., known for his work on the compass and on magnetism, died on April 3, at the age of eight-five years.

UNIVERSITY AND EDUCATIONAL NEWS

Mr. T. Harrison Hughes has given £50,000 and the Cunard Steamship Co., £10,000 to the

University of Liverpool as a contribution to the appeal for funds.

TEN members are reported by the *Journal* of the American Association to have resigned from the faculty of the Marquette University School of Medicine on account of a disagreement between them and the president over several ethical questions, one of which is that of sacrificing an unborn infant when necessary to save the life of the mother.

PROFESSOR J. H. CLO, of Tulane University, has accepted the position of professor and head of the department of physics at the University of Pittsburgh.

DR. HIRAM BYRD, now of the University of Mississippi, has accepted an invitation to become head of a new department of hygiene to be established at the University of Alabama.

LEO F. PIERCE, professor of chemistry at Washburn College, has resigned to work for a doctor's degree at Tulane University.

DR. CHARLES LOUIS MIX has accepted the position of head of the department of medicine of Loyola University School of Medicine.

DISCUSSION AND CORRESPONDENCE

RENEWAL OF OUR RELATIONS WITH THE SCIENTIFIC MEN OF EUROPE

TO THE EDITOR OF SCIENCE: A flood of publications is now coming in from all parts of Europe, especially from the long pent-up workers of France, of Austria, and of Germany, as well as in lesser degree from those of Great Britain and the Scandinavian countries. The German and French publications are as elegant in form and appearance as of old. The Austrian publications show very stringent conditions.

Arrangements are being made for coming scientific congresses and meetings. Certainly so far as science is related to human progress and welfare, it was never more widely needed all over Europe or all over the world than at the present moment. Certainly no one would shut off a British discovery, which would double the productive value of wheat, from the people of the ancient Central Empires. Certainly also any discovery made by savants of the Central Empires, which would mitigate human suffering or extend our knowledge, should be immediately transmitted to the people of the former Allied Powers. I, for one, am in favor of renewing scientific relations with the people of all countries of the world irrespective of whether they have been fighting with or against me in the great war for civilization. On this subject we have recently received very wise counsel from an entirely neutral party, Svante Arrhenius and his confrères. I may also quote from a letter of January 12, 1920, received from Arrhenius:

> I was very glad to receive your kind letter of December 3. I am in the highest degree thankful to you for your decision to keep up the perfect internationality of the Eugenics Congress. Now France and England have peace with Germany, and in old times it was always written in the peace treaties that the contracting parties should live on the best footing for the time to come. . . . Before the war the situation in Europe was one cause of the expensive armaments such that every German believed a (short) war would be much cheaper than the steadily increasing military expenses.
>
> In Austria the common expression was, "Lieber ein Ende mit Elend, als ein Elend ohne Ende." Now they have in reality the "Ende mit Elend." People are starving to death, many thousands every day. The children are infected with tuberculosis. The professors have their salaries of 12,000 kronen, which is now about 100 dollars, a year. The institutions are not heated. Series of experiments, which have taken many years, must be given up. The better classes are giving their clothes and their family relics for getting some foodstuffs from the peasants, who do not take the valueless paper money. The coal mines, which belonged to the companies in Vienna, have been given to the peasants of the state of Bohemia, which is according to letters from a Bohemian patriot under a bolshevist government, enriching itself and its friends through bribery. No coals are sent to Vienna, which is beset by starvation and cold. What have these old agreeable people in Vienna committed that they should be extirpated. . . .

From one of the most eminent men in Vienna, in fact, one of the most brilliant men in his subject in Europe, a colleague has received the following:

I perceive from your letter that my friend Dollo, whom I had informed of the critical conditions here with us, turned for aid to my friend Osborn. In fact, the past winter in Vienna was literally frightful. Your people have done a great deal for our children and in this way have aided materially in reducing the number of cases of sickness due to privation and hunger. The circumstance that Austria is reduced by the peace treaty to a relatively small country, and especially that it is limited to the mountain territories, which could not previously raise their own food supplies, and under the present bad conditions are still less able to provide for themselves, has shaped the situation since the end of the war for a catastrophe, as we are surrounded all about by new states which in part are unwilling to help us, as with Czechoslovakia and Hungary and Jugoslavia, and in part are unable to help because they themselves are in want, as with Germany. . . . Up to the present time destitution has attained terrible dimensions with us, and people have been dying like flies. The middle classes especially have been most heavily affected by these conditions as they were in no position to pass over to other classes the enormous increase in prices occasioned by the destitution, as the business and labor classes were enabled to do. We can only hope that as soon as political conditions will permit, Austria, now so much reduced in size and productivity in consequence of its geographical limitations that it will scarcely in the future be self-supporting, may be able to shape up some possibility for a continued existence. . . . (April 4, 1920.)

Despite these circumstances the writer of the above letter has succeeded in publishing a monumental work, printed on paper of the poorest quality, which must be used by all American students.

I have taken the liberty of quoting from these personal letters from two men in the very front rank in Europe, in order to present the actual situation to some of my colleagues who are still in doubt as to what their attitude should be. We geologists can not cut off communication with a country which has produced Edouard Suess. We paleontologists welcome the works of Othenio Abel.

As regards others, with whom personal relations are less close, I have decided neither to forgive nor to forget nor to extenuate, but *to carry on*. In brief, I find that it is my duty to renew scientific relations with all the specialists of Europe who are engaged in my lines of work, regardless of past or present geographic boundaries. Needless to say, I am now renewing personal relations with my former friends and colleagues, whatever their nationality.

Henry Fairfield Osborn

American Museum,
New York,
May 12, 1920

THE METEOR OF NOVEMBER 26, 1919

To the Editor of Science: From the Climatological Data, Michigan Section for November, 1919, issued from the Grand Rapids, Michigan Weather Bureau Office under the heading of "Remarks of Observers" on page 132, the following has been taken:

> Newberry—A large and brilliant meteor was observed at about 8 P.M. of the 26th; it looked to be about 38 inches in diameter. It was first seen in the southwest—rather low but considerably above the horizon—with its course southeastward and downward. At a point about 9° west of south, and near the horizon, it appeared to be bursting like a rocket as it sank from view.

This probably is an observation of the same meteor which was noticed in southern Michigan and supposed to have fallen into Lake Michigan near its southern end. This observation is 300 miles or more north of the previously supposed position of the meteor's descent.

William Kelly

Vulcan, Mich.

FORMULÆ FOR DATES

In my formulæ for finding the day of the week of any date (Science, May 21, 1920, p. 513) the explanation of the method of finding the value of the symbol L is not sufficiently clear for dates in centennial years. The following modification is therefore offered: L is the number of leapdays (not counting the one in a centennial year, if any) preceding the date and subsequent to the beginning of the centennial year having the

same first two digits as the year of the date in question.

Further study also reveals the fact that the formula for Old Style dates requires modification for dates in January and February of centennial years. This modification may best be made by starring the figure 5 of the formula and inserting the following footnote: *Use 4 instead of 5 for dates in January and February in centennial years.

W. J. SPILLMAN

THE LIBRARY OF THE LATE PROFESSOR ZUNTZ

TO THE EDITOR OF SCIENCE: A letter received from a friend in Berlin a few days ago brings information of the death of Professor N. Zuntz. The very great services of Professor Zuntz, extending over a long life time, devoted to the advancement of physiology and nutrition, his broad-mindedness and kindly character render his death at this time, when renewal of scientific associations severed by the war is so important, peculiarly sad.

The information comes also that, for the support of his widow who is a hopeless invalid, funds are needed. To this end it is desired to sell the large library which Professor Zuntz had collected. It includes complete sets of practically all of the journals in his field of work. By disposing of the library direct to some purchaser, or purchasers, in this country the advantage of the rate of exchange would accrue to the widow instead of to some book dealer.

I shall be glad to supply the address and such further information as I have to any one interested in the purchase of this library.

YANDELL HENDERSON
DEPARTMENT OF PHYSIOLOGY,
YALE UNIVERSITY

QUOTATIONS

WORK OF THE MAYO BROTHERS

A FRIEND of Christian civilization and a supporter of the present social order rejoices to visit such a shrine of philanthropy as can be found at Rochester, Minnesota. To that obscure and remote town came from England a good many years ago a physician and surgeon named Dr. W. W. Mayo. He had been brought up in an atmosphere of scientific progress and had studied with the English physicist, Dalton. He settled down to a general practise in Rochester and attained eminence in his profession. He had two sons, William and Charles, who followed his profession and developed the highest known skill in surgery, acquiring a reputation that brought people from the country around to seek relief at their hands. They soon discovered that their income was quite beyond their own need, and they conceived in their breadth of vision the opportunity of philanthropic progressive work for relief of their stricken fellowmen. They turned half of their income over to a business friend, with the request that he invest it and increase it; and thus in the days of rapid increase in values this fund became $2,000,000. Meantime their reputation grew, the demand for their service and for the enlargement and development of their plant greatly widened. They adopted the principle that no one needing surgical aid and coming to Rochester should be turned away without receiving it; that the rich and the moderately circumstanced should me made to pay in proportion to their means, and that the man without anything should receive aid for nothing. The amount received from the wealthy they apportioned with a view of creating a foundation for their clinic, which should continually enlarge its usefulness. Rochester is now a town of 14,000. It now has constantly 4,000 to 6,000 transient residents who are there for treatment. There are 900 beds all told in the various hospitals, and something more than 300 are being added. Sixty-thousand cases of all kinds are received and treated a year. The iron rule is that the poorest shall receive as careful and as good treatment as the wealthiest. The result has been that the name of the Mayos and Rochester has spread to the uttermost quarters of the world, and to-day a most cosmopolitan group greets the visitor in all the buildings in which this great philanthropy is carried on. As one notes the

crowds of people that gather from 7 in the morning until late in the evening exery day to await their turn for examinaton, diagnosis and treatment, he thinks that he has come to the shrine of a saint.—William Howard Taft in the Philadelphia *Public Ledger*.

THE JOURNAL OF MAMMALOGY

On April 3, 1919, the American Society of Mammalogists was founded at Washington, D. C. One of the principal objects of this society was the publication of a journal of mammalogy and on November 28 the first number of this journal appeared, from the press of Williams and Wilkins Company, Baltimore.

The arrival of the journal must have been a matter of gratification to the many students, scientific workers and others who are interested in the subject of mammalian life, for the need of such a publication has long been felt. In its aims this journal is broad, including within its scope morphology, evolution, paleontology, taxonomy, life histories and habits, in fact "every phase of technical and popular mammalogy." It is the announced purpose to make the journal indispensable to all active workers in mammalogy and of value "to every person interested in mammals, be he systematist, paleontologist, anatomist, museum or zoological garden man, big game hunter, or just plain naturalist."

In its make-up the journal seems in the opinion of the reviewer to be both substantial and attractive. The type is well chosen, the paper of good quality and the photographic reproductions contained give evidence that the illustrative features will be well handled. The front of its gray-green cover presents as decoration a pen drawing by Ernest Thompson Seton of the prong-horn antelope—symbol of something distinctively American. Below this is the table of contents and a glance at the list of contributors reveals the names of many well-known authorities in the field of mammalogy.

The first number consists of 51 pages, of which about 37 are devoted to major articles, 5 to general notes and about the same number to recent literature and 2 pages to editorial comment. On the closing pages are found the by-laws and rules of the society adopted at the time of its founding. The second number, which appeared promptly, includes pages 53 to 110.

An idea of the contents of the journal may best be conveyed by mention of a few representative titles. Among the major articles, of technical character are "Criteria for the recognition of species and genera," "Preliminary notes on African Carnivora," "Notes on the fox squirrels of the southeastern United States," "Names of some South American mammals," "A new fossil rodent from the Oligocene of South Dakota," "Identity of the bean mouse of Lewis and Clark." Among articles dealing with distribution, habits and other phases of life-history may be mentioned "Bats from Mt. Whitney, California," "The mammals of Southeastern Washington," "Migrations of the gray-squirrel," "An apparent effect of winter inactivity upon the distribution of mammals," "For a methodic study of life-histories."

Under General Notes, a department of the journal which promises to be one of unusual interest, are found among others, "An easy method of cleaning skulls," "Red bat and spotted porpoise off the Carolinas," "The Florida spotted skunk as an acrobat," "Rodent mountaineers," "Does the cuterebra ever emasculate its host?" "The coyote not afraid of water," "The flying squirrel as a bird killer," "Technical names of two *Colobus* monkeys."

In addition to reviews of recent literature each number contains a long list of titles of recent mammalogical publications, domestic and foreign, while in the correspondence and editorial departments appear some very readable letters and comments on topics of current interest to mammalogists.

In a magazine of the scope of the *Journal of Mammalogy* it seems inevitable that articles of certain types will at times predominate over other kinds and it is perhaps too much to expect that every number shall

have equal interest for all of its readers. It is a matter beyond the control of the management but one of which it is fully mindful and the editor very properly points out that if the magazine is to be a well-balanced one those members who are particularly interested in certain special phases of mammalian life must be largely responsible for furnishing the materials relating to their respective fields. In the opinion of the reviewer the management is to be congratulated upon the manner in which the journal has been launched. That the magazine will be indispensable to the active worker in the domain of mammalogy is a matter of course, but it seems also eminently worthy of a place in the libraries of all our schools and colleges where biological subjects are taught, for a sufficient number of articles of non-technical nature are assured to furnish highly profitable reading of a kind that can not help but be an incentive to a wider and more intelligent interest in mammalian life.

CHARLES E. JOHNSON
DEPARTMENT OF ZOOLOGY,
UNIVERSITY OF KANSAS

SPECIAL ARTICLES

FLUORESCENCE, DISSOCIATION AND IONIZATION IN IODINE VAPOR

I. FLUORESCENCE AND IONIZATION

EARLY attempts to account for fluorescence as due to radiation produced by the return to the parent molecules of electrons which were photoelectrically emitted by the exciting light have been unsuccessful, since the fluorescence of gases and vapors is not generally accompanied by ionization. Consequently, the recent viewpoint is that the primary effect of the exciting light is to cause one or more electrons of a molecule to take positions or conditions of abnormally large potential energy, without being necessarily removed from the parent molecule. This additional energy is absorbed from the exciting light, and is reemitted as radiation when the electrons return to their initial stable configurations. This fluorescent radiation may be of the same, of longer, or of shorter wave-length than the exciting light according as the return is accomplished in a single step, in several steps, or in a single step following the absorption of additional radiant energy.

We have obtained experimental evidence of the correctness of this viewpoint from measurements of the minimum energy required to ionize an iodine molecule in the normal state as compared with that required to ionize a fluorescing molecule. This energy is expressed, as usual, in terms of the minimum ionizing potential, which is found to be close to 10 volts for the normal molecule and 7.5 volts for the fluorescing molecule, excited by the green mercury line (whose wave-length is the same as that of the green absorption band of iodine, and which excites strong fluorescence). The difference, 2.5 volts, corresponds to the quantum of energy of the frequency of the exciting light by the quantum relation $eV = h\nu$. This offers direct evidence, therefore, of the existence of molecules whose electrons possess abnormal potential energy as a result of the exciting light. The existence of such unstable, and therefore active, molecules has particular bearing on the explanation of photochemical reactions, and suggests the process of chemical action recently proposed by Perrin.

II. DISSOCIATION AND IONIZATION

Two types of ionization were discovered in iodine vapour, a very weak ionization at 8.5 volts, attributed to the ionization of atoms present because of the hot filament which served as the source of the bombarding electrons, and a very intense ionization at 10 volts, attributed to the ionization of the molecules. This was tested by carrying out ionization experiments in a pyrex glass tube which could be highly heated in an electric furnace so that various degrees of dissociation of the iodine vapor could be obtained. The results thus obtained were consistent with the above assumptions that the ionizing potential of the iodine atom is 8.5 volts and that of the iodine molecule is 10 volts.

The interesting feature of this result is that the difference, 1.5 volts, corresponds exactly to V in the relation $eV = W$, where W is the heat of dissociation of iodine reckoned for a single molecule. In other words, the ioniza-

tion of an iodine molecule may consist in its dissociation and the ionization of one of the parts by the same electron impact.

This kind of a process has been suggested to estimate the heat of dissociation of hydrogen from ionization data, but the present work is the first, as far as we are aware, to give direct evidence as to which ionization effect is due to the atom and which to the molecule. It is probable that this method may be of value in determining heats of dissociation which are too high to be found by ordinary methods.

K. T. Compton,
H. D. Smyth

Princeton University,
May 18, 1920

THE AMERICAN PHILOSOPHICAL SOCIETY

At the 1920 general meeting of the American Philosophical Society, held on April 22, 23 and 24, in Philadelphia, the following comprehensive program was followed.

April 22, 2 o'clock

William B. Scott, D.Sc., LL.D., president, in the chair

Beach protection works: Lewis M. Haupt, Philadelphia.

Geographic aspects of the Adriatic problem: Douglas W. Johnson, professor of physiography at Columbia University. (Introduced by Professor W. M. Davis.)

The reefs of Tutuila, Samoa, in their relation to coral reef theories: Alfred G. Mayor, director of the department of marine biology, Carnegie Institution of Washington.

A distribution of land and water on the earth: Harry Fielding Reid, C.E., Ph.D., professor of dynamic geology and geography, Johns Hopkins University. The conception of the land of the earth as being a deeply dissected and loosely joined together mass, with its center about half way between the equator and the poles, explains nearly all the characteristics of the distribution of land and water, such as: the antipodal relation, the concentration of land about the north pole and of water about the south pole, etc.

Thyroxin: E. C. Kendall, Ph.D., of the Mayo Clinic, assistant professor of chemistry of the University of Minnesota. (Introduced by Dr. Philip B. Hawk.)

The dualistic conception of the processes of life: Samuel J. Meltzer, M.D., LL.D., head of department of physiology, Rockefeller Institute for Medical Research, New York. Animal life manifests itself by an uninterrupted stream of various forms of activities. But each of the activities is discontinuous, it is interrupted by a longer or shorter resting phase. Most physiologists look at life processes from a monistic point of view. In their opinion only action needs a cause; the reduction in action or the resting phase needs no special interpretation; they are simply due to a reduction in the extent of the cause or to its entire absence. However, seventy-five years ago, it was discovered by the brothers Weber that stimulation of the peripheral end of a vagus nerve stops the beating of the heart which remains resting in an increased state of diastole. Here a special cause, a stimulation of a nerve going to a muscle, causes a resting phase in the heart muscle. This action was termed inhibition. In the three quarters of a century since this discovery was made, numerous instances of inhibition in the various processes of animal life were discovered. From all the facts as they are known now, it must be assumed that there is in the animal life probably not a single function in which the phenomenon of inhibition is not an important factor. The part played by inhibition is on one hand to remove obstacles to an efficient action, and on the other hand to permit the living tissues to perform in the resting phase anabolic processes, that is, to build up the tissues or to replenish the material expended during the action phase. The dualistic conception of the life processes may be presented as follows. Irritability is a characteristic property of all living tissues. Irritability means the property of the tissues to react with a change in each state to a proper stimulus. The change may consist in an excitation, an increase of activity, or an inhibition, a decrease in activity. Each and every state of life of the plain tissues or of the complex functions is a resultant from the combination of the two antagonistic factors, excitation and inhibition. In a state of utmost rest the factor of inhibition prevails greatly; but there is still a remnant of the factor of the excitation which permits the tissues or the functions to remain in a state of tonus, of dormant life. On the other hand, in a state of extreme excitation there is still a remnant of the factor of inhibition which prevents the excitation from completely destroying the life of the involved tissues.

The relation of the bacillus influenza: FRANCIS G. BLAKE, M.D., associate in medicine, Hospital of the Rockefeller Institute for Medical Research, New York. (Introduced by Dr. A. C. Abbot.) Following Pfeiffer's discovery of *Bacillus influenzæ* in 1892 this organism was rather generally accepted as the probable cause of influenza, and of a characteristic type of bronchopneumonia which complicates influenza. Pfeiffer and others failed to support this possible etiological relationship by animal inoculation experiments. During the recent pandemic the causal relationship of *B. influenzæ* to the primary influenza has been seriously questioned and in general the organism has been relegated to the position of a secondary invader responsible for a variable proportion of bronchopneumonias complicating influenza. Because *B. influenzæ* is constantly present in the respiratory tract in uncomplicated influenza and in a characteristic type of bronchopneumonia following influenza, it seemed desirable to determine by animal experiments whether influenza and this type of bronchopneumonia could be produced by inoculation with pure cultures of *Bacillus influenzæ*. Twelve monkeys were inoculated on the mucous membranes of the nose and mouth with the successful production of an acute self limited respiratory disease closely resembling influenza. This disease was complicated in five cases by sinusitis, in three by bronchopneumonia. The pathology of the pneumonia was identical with the pathology of the pneumonia ascribed to pure infection of the lungs with *B. influenzæ* in man. Ten monkeys were inoculated in the trachea with pure cultures of *B. influenzæ* in man. Ten monkeys were inoculated in the trachea with pure cultures of *B. influenzæ* with the production of the same type of bronchopneumonia in seven cases. These experiments establish the etiological relationship of *Bacillus influenzæ* to the type of bronchopneumonia with which the organism has been found constantly associated in man. They also prove that *Bacillus influenzæ* can initiate an infection of the upper respiratory tract and produce a disease that closely resembles influenza, and that is complicated by the same complications as influenza. They do not prove that *Bacillus influenzæ* is the primary cause, however, since it is impossible to determine whether the disease produced in monkeys with *B. influenzæ* was actually identical with pandemic influenza.

X-rays of the brain after injection of air into the ventricles of the brain and into the spinal canal: W. E. DANDY, M.D., associate in surgery, Johns Hopkins Hospital. (Introduced by Dr. Keen.)

Celt and Slav: J. DYNELEY PRINCE, Ph.D., professor of Slavonic languages, Columbia University. Slavs and Celts are strikingly similar to each other in habits of mind and expression although far removed geographically. The Russians, Poles, Czecho-Slovaks, Serbo-Croatians and Bulgarians all speaking Slavonic idioms, although racially very various have certain marked traits in common which they all share with the Celts; viz., the Irish, Scottish and Manks Gaels and the Armorican Bretons of France, and the Welsh still Celtic speaking, and the Cornish, whose Celtic language is now extinct. The similarity between Slavs and Celts is twofold, viz., temperamental discontent and morbid joy in sorrow. As a concomitant of this discontent goes the spirit of quest after the unattainable, which is manifest in both Slavonic and Celtic trends of thought. Success plays almost no part as an element of heroism in Slavonic literature and comparatively a small rôle in Celtic. Both Celt and Slav are not satisfied with the present world, and care more for sympathy than for accomplishment. In Russia, especially, the public sympathy has been with the unsuccessful rather than with the successful hero. Morbid pleasure in failure, delight in a "lost cause," love of the appurtenances of death are all common and underlying Slavonic and Celtic traits. These characteristics are instructive as accounting for the "political impossibility" of the easternmost and westernmost branches of Indo-European language-influence. The sun of common sense has never risen on either the Slav or the Celt and it is doubtful whether the Slavs can exist very long without the guiding hand of strangers. The charm of the Celt and Slav is great and durable, but it is charm and not character, feeling and sentiment rather than thought and reasoning, which dominate the east and west of Europe alike.

A new theory of Polynesian origins: ROLAND B. DIXON, Ph.D., professor of anthropology, Harvard University. (Introduced by Dr. W. C. Farabee.) The question of the racial origins of the Polynesian peoples has long attracted the attention of anthropologists. Previous studies have dealt mainly with small portions of the area, and have not satisfactorily correlated the various factors characterizing physical types, nor the Polynesian types with those of the rest of Oceanica. The present study seeks to secure more satisfactory results by including the whole of Oceanica and eastern Asia in its scope. Following a method differing from those previously employed, a number of fundamental physical types are defined, and their distribution and that of their derivatives traced.

One of these fundamental types unexpectedly proves to be Negrito; the other two most important ones being Negroid and Malayoid. The Negrito and Negroid types being marginal in their distribution, are probably the older.

The Zoroastrian doctrine of the freedom of the will: A. V. Williams Jackson, professor of Indo-Iranian languages, Columbia University. The purpose of this paper was to show the signficance of the doctrine of the freedom of the will in the dualistic creed of Zoroaster more than two thousand five hundred years ago. The warring kingdoms of good and evil, light and darkness, personified as Ormazd and Ahriman, the ancient Persian god and devil, are in perpetual conflict, according to Zoroaster's philosophic teachings. While these two antagonistic principles, which struggle for the soul of man, are primeval and coeval, they are not coeternal, because Ormazd will triumph in the end and Ahriman will be annihilated. Man will help in bringing about the victory. Man is Ormazd's creature and belongs by birthright to the kingdom of good. He is created, however, a free agent, with the power of will to choose right or wrong. By the universal choice of right he will contribute his share towards the ultimate triumph of the hosts of heaven over the legions of hell at the final judgment day, and will win salvation for his soul. It was Zoroaster's mission in the world to guide man to make the right choice. Passages from the ancient Avestan and Pahlavi texts relating to the subject were translated, and emphasis was laid upon the interest which this old Zoroastrian doctrine in regard to the freedom of the will has for students of philosophy and religion.

The Hittite civilization: Morris Jastrow, Jr., Ph.D., LL.D., professor of Semitic languages, University of Pennsylvania. During the last four decades the discoveries and excavations in northern Asia Minor have brought the Hittite problem into the foreground of Oriental archeology. The notices about the Hittite groups found in the Old Testament and in the inscriptions of Egypt and Assyria have been supplemented by an abundance of material now at the disposal of scholars, though this can not be fully utilized until the large quantity of inscriptions in the Hittite characters have been satisfactorily deciphered. Even without this decipherment the monuments themselves tell us much of the important part played by the Hittites during the second millenium before this era in the ancient East. They seem to have been composed of a conglomeration of various ethnic elements and about 1500 B.C. a strong Hittite empire was located in northern Asia Minor which was powerful enough to threaten both Egypt, on the one side, and Babylonia and Assyria, on the other. These Hittites moving along the historical highway across Asia Minor left their rock monuments and their fortresses as traces of the power and civilization which they developed. Their contact with Assyria appears to have been particularly close and it is not impossible that the earliest rulers were actually Hittites. We find that at one time they extended far into Palestine. The "sons of Heth" associated in tradition with Abraham are Hittites and there were Hittite generals in the army of the Jewish kings. The introduction of cuneiform writing among the Hittites to replace their more cumbersome script is in itself an important indication of the close contact with Babylonian-Assyrian civilization as it also furnishes a definite basis upon which the decipherment of the Hittite language becomes a definite possibility.

The decipherment of the Hittite languages: Maurice Bloomfield, L.H.D., LL.D., professor of Sanskrit and comparative philology, Johns Hopkins University.

The beginning of the fourth gospel: Paul Haupt, Ph.D., LL.D., professor of Semitic languages, Johns Hopkins University. John i. 1, should be translated: In the beginning was Reason. Greek "logos" denotes both "word" and "reason." Logic is the science of reasoning. According to the Stoics, Reason (Greek Logos) was the active principle in the formation of the universe. We find stoic phraseology not only in the New Testament, but also in the Old Testament. The most valuable lessons of Stoicism were preserved in Christianity. Arthur W. Goodspeed

(To be continued)

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